

# GEONET - GPS Earth Observation System -

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## INTRODUCTION

Geographical Survey Institute (GSI) Japan is operating a nationwide GPS permanent observation array, GEONET. The network consists of about 1,230 stations (Fig.1), and almost all of them are operated in high-rate real-time mode. GSI routinely processes the data, and provide the data and the result to the public as basic location information. The real-time data is also provide to the public via private companies and utilized in various location information fields. The result is also utilized for monitoring crustal movements. GEONET has become basic social infrastructure in Japan.



## GEONET ANALYSIS STRATEGIES

GEONET has three different routine analysis strategies; Quick, Rapid and Final. Quick analysis is routinely executed every three hours with 6 hour obs. data and utilized especially for monitoring crustal movement. Rapid analysis is done every day with 24 hour data. Final analysis is executed with IGS final orbits. Therefore, it is executed two weeks after observation, and the most accurate analysis in GEONET. GEONET has two different emergency analysis strategies too. One is Special analysis. Special analysis is executed with any selected time window, and usually done just after earthquakes in order to estimate the crustal deformation caused by the earthquakes. Another emergency analysis is high-rate (1Hz) real-time analysis. The real-time analysis software is also able to handle high-rate kinematic post-processing. The real-time analysis is the quickest way to estimate crustal deformation after earthquakes.

## CRUSTAL DEFORMATION DETECTED BY GEONET

GEONET has shown its detection performance with several volcanic events and earthquakes. Figure 2 is one of the examples that the system shows its performance to detect crustal deformation.

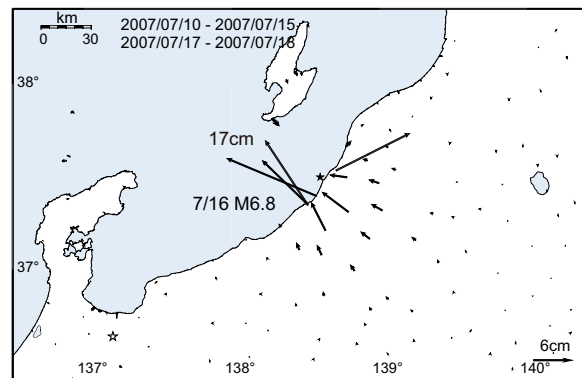


Fig.2 Horizontal displacement vector map of GEONET stations at the 2007 M6.8 Chuetsu-Oki earthquake. About 17cm displacement is detected around the epicenter.

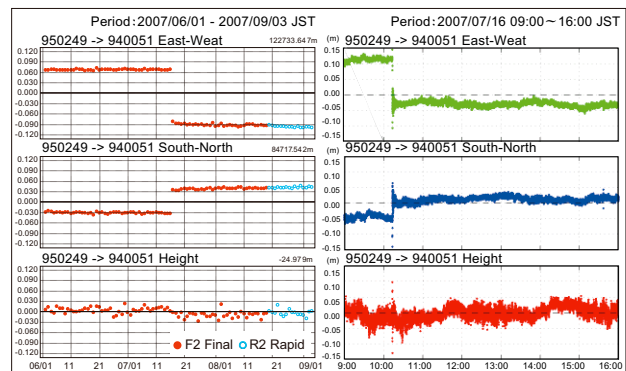


Fig.3 Graphs show time series of baseline (About 150km) components on the Chuetsu-Oki earthquake. The baseline shows the largest variation in the area. The left is the result of routine analyses, and the right is the result of high-rate kinematic post-processing. The horizontal displacements shown in two time series are very well consistent.

## REFERENCES

Hatanaka, Y., T. Iizuka, M. Sawada, A. Yamagiwa, Y. Kikuta, J. M. Johnson and C. Rocken (2004). Improvement of Analysis Strategy of GEONET, *Bulletin of Geographical Survey Institute*.